

**REMARKS**

This amendment is in response to the Office Action of October 31, 2001.

Claims 1 through 6 and 8 through 16 are currently pending in the application.

Claim 7 has been canceled.

Claims 1 through 11, 15 and 16 stand rejected.

Claims 4 through 6, 12 and 13 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 4 through 6 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. § 112, second paragraph, set forth in this Office Action and to include all of the limitations of the base claim and any intervening claims.

Applicants thank the Examiner for the indication of allowable subject matter.

Claims 1, 8 through 10 and 15 have been amended.

Applicants respectfully request reconsideration of the application as amended herein.

**35 U.S.C. § 112, second paragraph rejections as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention**

Claims 2 through 7 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants have amended claim 1 as suggested by the Examiner for the presently claimed invention to particularly point out and distinctly claim the subject matter of the invention to comply with the provisions of 35 U.S.C. § 112. Therefore, claims 2 through 7 are allowable under the provisions of 35 U.S.C. § 112.

**35 U.S.C. § 102(e) rejections as being anticipated by Boyd et al. (U.S. Patent 5,788,143)**

Claims 8 and 15 were rejected under 35 U.S.C. § 102(e) as being anticipated by Boyd et al. (U.S. Patent 5,788,143). Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Boyd et al. appears to disclose a single passageway (214) leading from a "vacuum pickup head" (211) as shown in FIG. 2. Boyd et al. discloses using a "control means" (215) to determine when suction from a vacuum pump will be supplied to the passageway (214) in order to pick up solder particles when the suction is supplied and release the particles when the suction is not supplied so they can fall under the influence of gravity (col. 4, lines 24 through 31 and 49 through 51.) Boyd et al. also makes a generalized disclosure of using positive pressure to eject the particles from the pickup head (211) (see col. 5, lines 13 through 17.)

However, Applicants submit that the Boyd et al. patent fails to anticipate each and every element as set forth in claims 8 and 15, as amended and presented herein. In particular, Boyd et al. fails to teach or suggest "a passageway leading from said chamber to a vacuum source; a passageway leading from said chamber to a pressurized gas; and controllable valve apparatus for controlling opening and closing said vacuum and pressurized gas passageways" as recited in now amended claims 8 and 15. Therefore, Applicants respectfully request that the rejection of claims 8 and 15 be withdrawn.

**35 U.S.C. § 103(a) rejections as being unpatentable over Boyd et al. (U.S. Patent 5,788,143) in view of Mays et al. (U.S. Patent 6,196,439)**

Claims 1 through 3, 9 through 11 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Boyd et al. (U.S. Patent 5,788,143) in view of Mays et al. (U.S. Patent 6,196,439). Applicants respectfully traverse this rejection as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Applicants further submit that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure.

Regarding claim 1, a *prima facie* case of obviousness is not met because the combined prior art references of Boyd et al. and Mays et al. do not teach or suggest all of the claim limitations of claim 1 as amended and presented herein. Specifically, the prior art references do not teach or suggest “[a] pickup tool for placing preformed solder balls on a substrate, comprising: a tool body controllably movable in multiple axes and rotatable about an axis; a plurality of ball seats formed in said body for said preformed solder balls, said plurality of ball seats each having an aperture therein; **passageways leading from said aperture to a vacuum source and to a pressurized gas source**; and valve apparatus for controlling separately and independently a vacuum and a gas under pressure to said ball seats, said vacuum retaining

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said solder balls on said ball seats, and said pressurized gas releasing said solder balls from said ball seats," as recited in now amended claim 1. (Emphasis added.) Rather, Boyd et al. appears to disclose a single passageway (214) leading from a "vacuum pickup head" (211) (see FIG. 2) and a single "control means" (215) to determine when suction from a vacuum pump is applied (col. 4, lines 24 through 31.) Mays et al., while disclosing an apparatus which applies a vacuum source to pick up an electronic device (col. 5, lines 51 through 54), appears to be silent on the subject matter of using pressurized gas to release the electronic device from the apparatus or pathways leading to a vacuum pump and a pressurized gas which can be controlled separately. Therefore, Applicants respectfully request that the rejection of claim 1 be withdrawn.

Claims 2 and 3 are each allowable as depending from now amended claim 1 which is allowable.

Claim 9 is allowable, among other reasons, as depending from now amended claim 8 which is allowable. Amended claim 9 is further allowable as it recites, *inter alia*, "a heater to heat said pickup tool." There is no motivation to modify Boyd et al. with the teachings of Mays et al. by adding a heater to the pickup head of Boyd et al.. Mays et al. teaches conducting heat through a pickup tool to an electronic device being picked up by the tool in order to heat solder balls that have come in contact with the electronic device (col. 5, lines 57 through 61.) There is a lack of motivation to combine the two references because the pick up head used in Boyd et al. never comes into contact with any electronic device in order to conduct heat through it to the solder balls.

Further, while Boyd et al. teaches picking up solder balls with a pick up tool, it actually teaches away from transferring heat to the solder balls through conduction via the pick up head as taught by Mays et al.. Boyd et al. teaches that once the solder balls have been placed on the contacts of the direct chip attach (DCA) chip sites, the pick up head is moved away from the DCA site and that a reflow head (511) with a heat source (512) is positioned over the site to apply heat to the solder particles (see FIG. 5; col. 4, lines 50 through 57.) Thus, the apparatus and method taught by Boyd et al. provides that no contact is made between the pick up head and

the solder balls (or electronic device) while the solder balls are being heated. Therefore, applicants respectfully request that the rejection of claim 9 be withdrawn.

Regarding claim 10, a *prima facie* case of obviousness is not met because the combined prior art references of Boyd et al. and Mays et al. do not teach or suggest all of the claim limitations of claim 10 as amended and presented herein. Specifically, the prior art references do not teach or suggest “[a] pickup tool for placing preformed solder balls on a substrate, comprising: a tool body controllably movable in multiple axes and rotatable about an axis; a plurality of ball seats formed in said tool body for a plurality of solder balls, each ball seat of said plurality of ball seats having an aperture therein; **passageways leading from said aperture to a vacuum source and to a pressurized gas; and controllable valve apparatus controlling the vacuum and the pressurized gas to said ball seat**, said vacuum retaining said solder ball in each said ball seat and said pressurized gas releasing said solder ball from said ball seat,” as recited in now amended claim 10. (Emphasis added.) Rather, Boyd et al. appears to disclose a single passageway (214) leading from a “vacuum pickup head” (211) (see FIG. 2) and a single “control means” (215) to determine when suction from a vacuum pump is applied (col. 4, lines 24 through 31.) Mays et al., while disclosing an apparatus which applies a vacuum source to pick up an electronic device (col. 5, lines 51 through 54), appears to be silent on the subject matter of using pressurized gas to release the electronic device from the apparatus or pathways leading to a vacuum pump and a pressurized gas. Therefore, Applicants respectfully request that the rejection of claim 10 be withdrawn.

Claim 11 is allowable as depending from now amended claim 10 which is allowable.

Claim 16 is allowable, among other reasons, as depending from now amended claim 15 which is allowable. Amended claim 16 is further allowable as it recites, *inter alia*, “a heater to heat said solder balls.” As discussed above, there is no motivation to modify Boyd et al. with the teachings of Mays et al. by adding a heater to the pickup head of Boyd et al.. Mays et al. teaches conducting heat through a pickup tool to an electronic device being picked up by the tool in order to heat solder balls that have come in contact with the electronic device (col. 5, lines 57 through

61.) There is a lack of motivation to combine the two references because the pick up head used in Boyd et al. never comes into contact with any electronic device in order to conduct heat through it to the solder balls.

Further, while Boyd et al. teaches picking up solder balls with a pick up tool, it teaches away from transferring heat to the solder balls through conduction via the pick up head as taught by Mays et al.. Boyd et al. teaches that once the solder balls have been placed on the contacts of the direct chip attach (DCA) chip sites that the pick up head is moved away from the DCA site and that a reflow head (511) with a heat source (512) is positioned over the site to apply heat to the solder particles (*see FIG. 5; col. 4, lines 50 through 57.*) Thus, the apparatus and method taught by Boyd et al. provides that no contact is made between the pick up head and the solder balls (or electronic device) while the solder balls are being heated. Therefore, applicants respectfully request that the rejection of claim 16 be withdrawn.

**35 U.S.C. § 103(a) rejections as being unpatentable over Boyd et al. (U.S. Patent 5,788,143) and Mays et al. (U.S. Patent No. 6,196,439) in view of Ledermann et al. (U.S. Patent No. 4,934,309)**

Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Boyd et al. and Mays et al. as applied to claim 1 above, and further in view of Ledermann et al. (U.S. Patent No. 4,934,309). Applicants have canceled claim 7, thus mooting this rejection.

**Objections to claims 4 through 6, 12 and 13/Allowable subject matter**

Claims 4 through 6, 12 and 13 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants acknowledge this indication with

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appreciation and respectfully submit that these claims are allowable in their present form, depending from their respective independent claims as amended herein.

**Conclusion**

Applicants submit that claims 1 through 6 and 8 through 16 are clearly allowable over the cited prior art.

Applicants request the allowance of claims 1 through 6 and 8 through 16 and the case passed for issue. Should the examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,



James R. Duzan  
Attorney for Applicants  
Registration No. 28,393  
TRASKBRITT, PC  
P.O. Box 2550  
Salt Lake City, Utah 84110  
(801) 532-1922

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Enclosure: Version with Markings to Show Changes Made

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**APPENDIX A**

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS:**

A marked-up version of each of the presently amended claims, highlighting the changes thereto, follows:

1. (Amended) A pickup tool for placing preformed solder balls on a substrate, comprising:

a tool body controllably movable in multiple axes and rotatable about an axis;

a plurality of ball seats formed in said body for said preformed solder balls, said plurality of ball seats each having an aperture therein;

[a passageway] passageways leading from said aperture to a vacuum source and to a pressurized gas source; and

valve apparatus for controlling separately and independently a vacuum and a gas under pressure to said ball seats, said vacuum retaining said solder balls on said ball seats, and said pressurized gas releasing said solder balls from said ball seats.

8. (Amended) A pickup tool for placing a plurality of solder balls on ball-grid-array bond pads of a substrate, said pickup tool comprising:

a pickup tool body with a hollow chamber therein;

a lower plate having a plurality of seats therein for retaining a solder ball in each seat, said

plurality of seats corresponding to an inverted configuration of an array of bond pads on a substrate;

a plurality of passageways leading from each said seat to said hollow chamber;

a passageway leading from said chamber to a vacuum source;

a passageway leading from said chamber to a pressurized gas; and

controllable valve apparatus for controlling opening and closing said vacuum [passageway] and pressurized gas passageways.

9. (Amended) The pickup tool of claim 8, further comprising:  
a heater to heat said pickup tool to a temperature to bond said solder balls [bond] to said bond pads of said substrate.

10. (Amended) A pickup tool for placing preformed solder balls on a substrate, comprising:  
a tool body controllably movable in multiple axes and rotatable about an axis;  
a plurality of ball seats formed in said tool body for a plurality of solder balls, each ball seat of said plurality of ball seats having an aperture therein;  
[a passageway] passageways leading from said aperture to a vacuum source and to a pressurized gas; and  
controllable valve apparatus controlling the vacuum and the pressurized gas to said ball seat, said vacuum retaining said solder ball in each said ball seat and said pressurized gas releasing said solder ball from said ball seat.

15. (Amended) A pickup tool for placing a plurality of solder balls on ball-grid-array bond pads of a substrate, said pickup tool comprising:  
a pickup tool body with a hollow chamber therein;  
a lower plate having a plurality of seats therein for attracting and retaining a solder ball in each seat, said plurality of seats corresponding to an inverted array of bond pads on a substrate;  
passageways leading from each said seat of said plurality of seats to said hollow chamber;  
a passageway leading from said chamber to a vacuum source;  
a passageway leading from said chamber to a pressurized gas; and  
controllable valve apparatus for controlling [controllably] opening and closing said vacuum and pressurized gas passageways.